Complete the following:

p. 675 - 676

#17: complete a test ($\neq$)
and then an appropriate conf. interval

Ho: $\beta_1 = 0$
Ha: $\beta_1 \neq 0$

Conditions:

| | |
|---|---|
| 1) SRS | 1) assumed representative |
| 2) Linear data | 2) scatterplot is linear |
| 3) Independent | 3) each car is indep. of the others |
| 4) Normal resid. | 4) histogram of the residuals is symmetric, unimodal |
| 5) Equal variance | 5) the residual plot shows no change in the spread of the residuals |

conditions met --> t-distribution --> LinReg T test

$t = \frac{-8.21362}{0.6738} = -12.2$ (or -12.19)

$P(t < -12.2) = 0$ df = 48

We reject Ho b/c the p-value of 0 < alpha = 0.05.

We have sufficient evidence that the slope of the population regression line is not equal to 0.

Therefore, as weight of a car increases, the fuel efficiency (mpg) changes.

95% confidence interval: df = 48

Conditions met, t distribution, LinReg t Interval

$-8.21362 \pm (2.0106)(0.6738) =$ (-9.56832, -6.85892)

We are 95% confident that for every increase of 1000 lbs of a car's weight, the fuel efficiency decreases between 6.859 mpg and 9.568 mpg.

## Ch. 27 Part 2

Using Actual data to test the slope

Example: Airfare Data (Dist vs. Airf)
Test to see if the slope of the pop. regr. line between distance and airfare is positive.

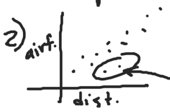
Hypotheses:
Ho: $\beta_1 = 0$
Ha: $\beta_1 > 0$

Conditions:

1) SRS
2) Linear data
3) Indep.
4) Normal resid.
5) Equal Variance

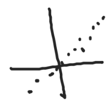
Conditions met
t distrib.
Lin Reg t test

1) Assume flights are representative

2) 

scatterplot linear, 2 poss. outliers

3) Assume flights are indep. of each other.

4) 
Normal prob. plot is linear → normal resid.

5) 

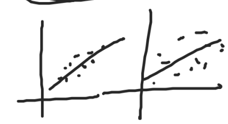
Resid plot is scattered

Mechanics:

Test Stat:

$$t = \frac{b_1}{SE_{b_1}} = \frac{0.1174}{0.0283} = 4.144$$

$S \neq SE_b$



$4.144 = \frac{0.1174}{x}$

P-Value

$$P(t > 4.144) = 9.993 \times 10^{-4}$$

$df = 10$

Conclusion:

Confidence Interval:

Conf = 90% df = 10

cond. met, t distr, LinReg t Interval

$$0.1174 \pm (1.8125)(0.0283)$$
$$= (0.06604, 0.16871)$$

Practice:

p. 675 #14 & 16

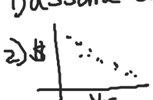
p. 679 #34- do not do letter (a)

14) $H_0: \beta_1 = 0$
$H_a: \beta_1 < 0$

p. 675

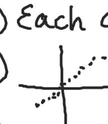
Conditions:
1) SRS
2) Linear data
3) Indep.
4) Normal resid
5) Equal var.

1) assume cars are representative.

2) 

Scatterplot is linear

3) Each car is indep. of others

4) 
normal prob. plot is linear → normal resid.

5) 

resid plot is mostly scattered.

Cond. met, t distrib, LinReg t test

$t = \frac{b_1}{SE_{b_1}} = \frac{-959.05}{64.582} = -14.85$

$P(t < -14.85) = 7.8118 \times 10^{-10}$

$-14.85 = \frac{-959.05}{x}$

df = 13

- Reject Ho...
- slope of pop. reg. line < 0.
- Therefore as age of car increases, price decr.

α = 0.05
Ha: <
C = 90%
df = 13
INVT
N = ? 14
C = ? 90

Cond. met, t distrib, LinReg t Int.

$b_1 \pm (t^*)(SE_{b_1})$

$-959.05 \pm (1.771)(64.582)$

$= (-1073, -844.70)$

We are 90% conf. that for every year older the car gets, the price decreases btw. \$844.70 and \$1073.

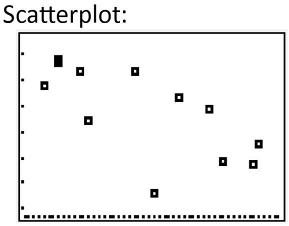
invT(0.05, 13)

p. 679 #34- do not do letter (a)

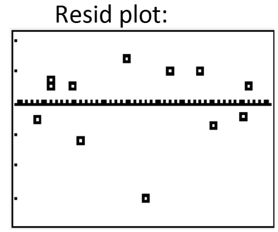
① type in data

② LinReg(a+bx) $L_1, L_2$

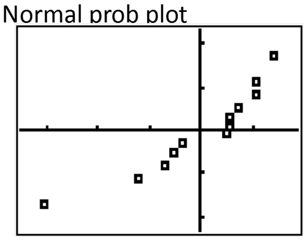
Scatterplot:



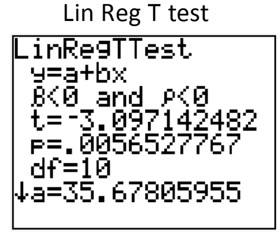
Resid plot:



Normal prob plot



Lin Reg T test




34) (b) Ho: $\beta_1 = 0$
Ha: $\beta_1 < 0$

Conditions:

| | |
|---|---|
| 1) SRS | 1) assumed representative |
| 2) linear data | 2) scatterplot is linear, one poss. outlier |
| 3) independent | 3) each baby is indep. of the others |
| 4) normal resid. | 4) normal prob. plot of resid. is roughly linear --> normal data |
| 5) Equal variance | 5) the residual plot shows no change in the spread of the residuals (poss. outlier) |

conditions met --> t-distribution --> LinReg T test

$t = \frac{-0.0778}{0.02512} = -3.097$

$-3.097 = \frac{-0.0778}{SE_b}$

P(t < -3.097 | df = 10) = 0.00565

We reject Ho b/c p-value of 0.00565 < alpha = 0.05.

We have sufficient evidence that the slope of the population regression line between 6-month temp & avg. crawling age is less than to 0.

Thus as 6 month temperature increases, average crawling age decreases.

(c) conditions met --> t distribution --> LinReg t-Interval

$-0.0778 \pm (2.228)(0.02512) = (-0.13377, -0.02183)$

We are 95% confident that for every increase in 1 degree of the average 6 month temperature, the average crawling age decreases between 0.02183 and 0.13377 weeks.